

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF WEST VIRGINIA
CHARLESTON DIVISION

B.P.J., by her next friend and mother,
HEATHER JACKSON,

Plaintiff,

vs.

WEST VIRGINIA STATE BOARD OF
EDUCATION; HARRISON COUNTY BOARD
OF EDUCATION; WEST VIRGINIA
SECONDARY SCHOOLS ACTIVITIES
COMMISSION; W. CLAYTON BURCH, in his
official capacity as State Superintendent, DORA
STUTLER, in her official capacity as the
Harrison County Superintendent, and the
STATE OF WEST VIRGINIA,

Defendants,

and

LAINY ARMISTEAD,

Defendant-Intervenor.

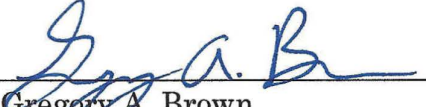
Case No. 2:21-cv-00316

Hon. Joseph R. Goodwin

DECLARATION OF GREGORY A. BROWN, PHD., FACSM

I, Dr. Gregory A. Brown, pursuant to 28 U.S. Code § 1746, declare under penalty of perjury under the laws of the United States of America that the facts contained in my Supplemental Expert Report of Gregory A. Brown, Ph.D. FACSM in the Case of B.P.J. v. West Virginia State Board of Education, attached hereto, are true and correct to the best of my knowledge and belief, and that the opinions expressed therein represent my own expert opinions.

Executed on October 21, 2022.



Gregory A. Brown

**Supplemental Expert Report of Gregory A. Brown, Ph.D. FACSM in the
case of B.P.J. vs. West Virginia State Board of Education**

October 21, 2022

Introduction

Since the submission of my expert report of February 23, 2022, in *B.P.J. v. West Virginia State Board of Education*, I have become aware of a number of developments in physiology scholarship and sports policy concerning the participation of biological males who identify as female in women's sports. The purpose of this supplement is to update my report with these developments and explain how they bear on the opinions expressed in my report.

Effects of Puberty Suppression on the Components of Athletic Performance

1. In Boogers et al. (2022), the researchers studied the effects of puberty suppression followed by cross-sex hormone therapy on the adult height of natal males who identify as female. Analyzing retrospective data collected from 1972 to 2018, they concluded that “although P[uberty] S[uppression] and [cross-sex hormones] alter the growth pattern, they have little effect on adult height.” (9) In other words, natal males who followed a normal course of puberty suppression followed by cross-sex hormone therapy reached an adult height at or near their predicted height in the absence of such therapy.¹

¹ Eleven participants were given a high dose of the cross-sex hormone ethynyl estradiol (EE) instead of a normal course of estradiol in an attempt to reduce growth, and the researchers found a small reductive effect. They noted, however, that the study did not evaluate the side effects of high-dose EE, that their clinic was studying alternatives to high-dose EE “[b]ecause of the increased risk of venous thromboembolism,” and that high-dose EE “is no longer used to limit growth” in cisgender girls because of the potential side effects. (9) Based on population-level data, it does not appear that the reductive effect of high-dose EE on height eliminated the male-female height differential, but the authors of the paper did not address that question.

2. In my report, I cited Roberts and Carswell (2021) noting the dearth of published research on the effects of puberty suppression followed by cross-sex hormones in adult height. (1680–81) The Boogers study helps to fill that gap in the published literature with peer-reviewed evidence that puberty suppression followed by cross-sex hormone therapy does not meaningfully affect adult height.

3. This is relevant to the question of whether puberty suppression eliminates sex-based performance advantages. It provides evidence that an important component of that advantage—male vs. female height—is not eliminated, or even meaningfully affected, by an ordinary course of puberty suppression followed by cross-sex hormone therapy. *See* Brown Rep. ¶¶ 43–44 (discussing male height advantage).

4. In my report, I stated: “There is not any scientific evidence that [puberty blockers] eliminate[] the pre-existing performance advantages that prepubertal males have over prepubertal females.” Brown Rep. ¶ 113. That remains true. And the Boogers study strengthens that conclusion with evidence that the male height advantage is not eliminated by puberty suppression followed by cross-sex hormone treatment.

Additional Research on the Effects of Testosterone Suppression

5. I cited a variety of peer-reviewed research supporting the proposition that testosterone suppression does not erase male performance advantage in most athletic endeavors in my report. *See generally* Brown Rep. ¶¶ 119–57.

6. Heather (2022) is a new peer-reviewed literature review examining the evidence to date on whether testosterone suppression eliminates the physiological building blocks of male athletic advantage. In this review, Dr. Heather studied the existing literature on male advantages in brain structure, muscle mass, bone structure, and the cardio-respiratory system, and the effects of testosterone suppression on those advantages. She concluded:

Given that the percentage difference between medal placings at the elite level is normally less than 1%, there must be confidence that an elite transwoman athlete retains no residual advantage from former testosterone exposure, where the inherent advantage depending on sport could be 10–30%. Current scientific evidence can not [sic] provide such assurances and thus, under abiding rulings, the inclusion of transwomen in the elite female division needs to be reconsidered for fairness to female-born athletes. (8)

7. This study is relevant because it demonstrates that a well-respected physiologist has reviewed the literature and come to the same basic conclusion as set forth in my expert report: based on the best current scientific evidence, testosterone suppression does not erase male performance advantage.

8. Alvares (2022) is a new cross-sectional study on cardiopulmonary capacity and muscle strength in biological males who identify as female and have undergone long-term cross-sex hormone therapy.

9. All of the study subjects that were biological males who identify as female had testosterone suppressed through medication (cyproterone acetate) or gonadectomy. (Supplementary materials) And they had taken exogenous estrogen for an average of 14.4 years with a standard deviation of 3.5 years.

10. Compared to a control group of cisgender women, the study subjects exhibited advantages in body height, body mass, lean body mass, and muscle strength, confirming the findings of previous studies but extending the information to a longer time period. A novel aspect of this study is the demonstration that, even after 14 years of testosterone suppression and estrogen administration, the biological males who identify as female exhibited advantages in cardio-respiratory capacity measured as higher VO_2 peak and higher O_2 pulse, which suggests that male advantages are retained in events that are influenced by cardio-respiratory endurance (e.g. distance running, cycling, swimming, etc.).

11. This study provides further reliable evidence that even long-term testosterone suppression does not eliminate all of the sex-based athletic advantages between males and females and that there is retained advantage in cardiopulmonary capacity and muscle strength.

New Athletic Organization Policies

12. Since my report of February 23, 2022, there have been additional developments in the ways athletic associations have addressed the participation of male athletes who identity as female in the female category. As noted in my report, policymaking in this area is in flux, and numerous athletic associations are in the process of revising their policies. The following non-exhaustive description of new policies since the issuance of my report include the following.

13. ***Aquatics.*** FINA, the international aquatics (swimming and diving) federation, issued a new policy in June 2022 allowing biological males to compete in the female category of aquatics only if they can establish that they “had male puberty suppressed beginning at Tanner Stage 2 or before age 12, whichever is later, and they have since continuously maintained their testosterone levels in serum (or plasma) below 2.5 nmol/L.” FINA Policy on Eligibility for the Men’s and Women’s Categories § F.4.b.ii. A biologically male athlete who cannot meet these criteria is prohibited from competing in the female category. *Id.*

14. This policy is based on the review of the scientific literature conducted by an independent panel of experts in physiology, endocrinology, and human performance, including specialists in transgender medicine. This panel concluded:

[I]f gender-affirming male-to-female transition consistent with the medical standard of care is initiated after the onset of puberty, it will blunt some, but not all, of the effects of testosterone on body structure, muscle function, and other determinants of performance, but there will be persistent legacy effects that will give male-to-female transgender athletes (transgender women) a relative performance advantage over biological females. A biological female athlete cannot overcome that

advantage through training or nutrition. Nor can they take additional testosterone to obtain the same advantage, because testosterone is a prohibited substance under the World Anti-Doping Code. (2)

15. **Rugby.** In July 2022, England’s Rugby Football Union and Rugby Football League both approved new policies limiting the female category to players whose sex recorded at birth is female for contact rugby for the under 12 age group and above. Rugby Football League Gender Participation Policy § 4.2(d); Rugby Football Union Gender Participation Policy § 4.2(d).

16. In August 2022, the Irish Rugby Football Union adopted the same policy. Irish Rugby Football Union Gender Participation Policy §§ 4.5(b) & (f).

17. In September 2022, the Welsh Rugby Union also adopted the same policy.²

18. These bodies based their policy on a review of the scientific research, which showed that male advantage “cannot be sufficiently addressed even with testosterone suppression.” Rugby Football Union Gender Participation Policy § 3.4; *see also* Rugby Football League Gender Participation Policy § 3.4; Irish Rugby Football Union Gender Participation Policy § 4.3.

19. **Triathlon.** In June 2022, British Triathlon adopted a new policy limiting competition in the female category to “people who are the female sex at birth.” British Triathlon Transgender Policy § 7.2.

20. This policy is based on its review of the scientific literature and conclusions that “the scientific community broadly agrees that the *majority* of the physiological/biological advantages brought about by male puberty are retained (either wholly or partially) by transwomen post transition” and that testosterone suppression does not “sufficiently remove[] the retained sporting performance

² <https://www.wru.wales/2022/09/wru-updates-gender-participation-policy/>.

advantage of transwomen.” British Triathlon Transgender Policy § 2 (emphasis in original).

21. In August 2022, World Triathlon issued a new policy limiting the female category to biological females and to biological males who have suppressed circulating testosterone to 2.5 nmol/L for at least 24 months and have not competed in the male category in at least 48 months. World Triathlon Transgender Policy Process § 3. Previously, it had followed the old IOC guidelines of requiring testosterone suppression to 10 nmol/L for at least 12 months.

22. In issuing this policy, World Triathlon stated that “the potential advantage in muscle strength/power of Transgender women cannot be erased before two years of testosterone suppression.” World Triathlon Transgender Policy Process § 3. Notably, World Triathlon did not assert that two years of testosterone suppression actually erases male performance advantage, nor did it cite any evidence that would support such a proposition.³

23. Although World Triathlon listed sports scientists Drs. Emma Hilton and Ross Tucker as consultants in developing the new policy, both immediately criticized the policy as allowing male advantage into female triathlon competitions.⁴

24. Another sports scientist listed as a consultant to World Triathlon, Dr. Alun Williams, has opined that basing eligibility on circulating testosterone levels is

³ The sentence quoted above cites to Roberts (2020), which, as noted in my report, did not find that male performance advantage was erased after two years. To the contrary, after two years, the male-to-female transitioners maintained an advantage over biological females in the 1.5 mile run. *See* Brown Rep. ¶ 134. Further, the sit-up and push-up results strongly suggested a retained advantage in overall strength. *See* Brown Rep. ¶ 131.

⁴ *See* <https://twitter.com/scienceofsport/status/1555072611285143552>; <https://twitter.com/FondOfBeetles/status/1555518655806537729>.

not evidence-based policymaking because of the lack of evidence that testosterone suppression eliminates male performance advantage.⁵

25. **Cycling.** In June 2022, UCI, the world cycling federation, changed its eligibility criteria for males who identify as female competing in the female category from 12 months of testosterone suppression to the level of 5 nmol/L to 24 months of testosterone suppression to the level of 2.5 nmol/L. UCI Rules § 13.5.015.

26. In releasing the new policy, UCI cited a position paper by Prof. Xavier Bigard (2022), which concluded that the “potential [male] advantage on muscle strength / power cannot be erased before a period of 24 months.” (15) Notably, Prof. Bigard did not assert that the best available evidence shows that male advantage is actually erased after 24 months; he merely asserted that the evidence shows that male advantage is *not* erased *before* 24 months.⁶

27. **Boxing.** In August 2022, the World Boxing Council issued a new policy requiring athletes to compete in accordance with their natal sex. World Boxing Council Statement/Guidelines Regarding Transgender Athletes Participation in Professional Combat Sports. The WBC concluded that any other policy would raise “serious health and safety concerns.” *Id.* ¶ 5.

28. **Conclusion.** These new policies represent a growing recognition among athletic organizations that the best available science shows that male performance advantage is retained despite testosterone suppression. To be sure, different athletic organizations prioritize the competing values of fairness, safety, and inclusion in different ways. But increasingly, athletic organizations are making policy against the backdrop of a scientific consensus that male advantage in most

⁵ See <https://www.pressreader.com/uk/the-mail-on-sunday/20220327/284399857680074>.

⁶ The sentence quoted above also cites to Roberts (2020), which, as noted, did not find that male strength or performance advantages were erased after two years. See *supra* note 3.

athletic endeavors is substantial, and that there is no regimen of testosterone suppression proven to eliminate that advantage. That consensus is even clearer now than it was when I issued my report in February 2022, and the spate of new athletic policies reflects increasing awareness and acceptance of the available science.

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